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Indonesia: Deteriorating Prospects for Energy Diversification [redacted] 25X1

An Intelligence Assessment

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Indonesia: Deteriorating Prospects for Energy Diversification

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An Intelligence Assessment

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directed to the Chief, Southeast Asia Division, OEA,

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Indonesia: Deteriorating Prospects for Energy Diversification

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Key Judgments

Information available as of 1 June 1983 was used in this report.

If trends now under way continue, Indonesia's oil export capacity will fall 35 percent to less than 700,000 b/d by 1990 despite the presence of other abundant domestic energy resources and ambitious plans to develop them. Less oil probably would be available for the United States, which is now Indonesia's second most important export market after Japan. Moreover, legal and environmental obstacles to US imports of Indonesian liquefied natural gas (LNG) could cause friction between Jakarta and Washington as the Indonesians seek to expand their LNG exports.

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Development of other energy resources to cushion the decline of oil available for export will fall short of goals. Prospects are brightest for LNG exports in the Pacific Basin, but development of coal and hydropower resources, already falling behind schedule, will be further delayed by the recent sharp deterioration in the country's finances caused by the soft oil market and global recession. Indeed, the current squeeze on government finances is forcing Jakarta to reassess its development priorities, and some major energy diversification projects have been shelved at least temporarily.

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Rapid labor force growth and rising unemployment in the 1980s, moreover, may force the government to direct an increasing share of financial resources to social programs at the expense of development, which would further crimp plans for energy diversification.

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Indonesia's energy prospects would brighten if international oil prices rebound or some new windfall, such as the discovery of another supergiant oilfield, improved oil export earnings and provided both a renewed incentive and the financial means to speed development of alternative energy resources.

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Oil and the Economy

Crude oil production, supplemented in recent years by natural gas, has underpinned the country's economic growth since President Soeharto came to power in the late 1960s. Growing oil revenues in the 1970s boosted government spending from less than 10 percent of GDP in 1970 to 25 percent a decade later. Oil exports, accounting for 70 percent of foreign exchange earnings and some 60 percent of government revenues by the end of the decade, helped boost investment expenditures from 15 percent to 20 percent of GDP during the period, thus enhancing the government's efforts to assure political stability through economic growth.

Changing international market conditions and shifts in Indonesian policies have caused sharp fluctuations in exploration and production by the foreign, mostly US, oil companies that dominate Indonesia's oil industry in partnership with Pertamina, the state oil company. Output rose rapidly from the late 1960s to a peak of 1.68 million b/d in 1977 in response to growing foreign demand, OPEC's oil price hikes, and Jakarta's generous production-sharing contract terms. Output slipped after 1977 until a second exploration boom reversed the decline in 1981 and restored production to 1.6 million b/d.

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The onset of the world oil glut ended the second oil boom in 1982. Unlike the earlier cycle, when production continued to climb for two years after exploration turned down, output declined faster in 1982 as OPEC imposed a production ceiling of 1.3 million b/d on Indonesia as part of the cartel's effort to maintain official prices during the oil glut. Jakarta's unwillingness to offer price discounts caused output to fall below the ceiling to 1 million b/d in early 1983. By May 1983, output had recovered to 1.3 million b/d. According to press reports, however, Indonesian crude is still facing stiff competition from Iranian oil exports to Japan, Indonesia's largest market.

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Indonesia: Deteriorating Prospects for Energy Diversification

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Indonesia's Oil Dilemma

Indonesia's oil production capacity probably will level off in the next few years considerably below the government's 1989 target output of 1.9 million b/d. The country's most prolific fields, particularly the supergiant [1] Minas field in Central Sumatra, which has been producing oil since 1952, have passed their peak output levels and are in a state of long-term decline. Secondary recovery programs, such as water injection at the Minas field, in our view, will stem the decline in output only temporarily as reserves are depleted.

The probability that new discoveries will boost output is low. Most of Indonesia's oil is found in small fields that are quickly depleted, and an active exploration program is necessary simply to replace the reserves used up each year through production. Assuming that oil companies maintain the recent high level of exploration, Indonesia should be able to hold production capacity at about 1.6 million b/d through the 1980s. Unless another supergiant field is discovered, we believe prospects for boosting sustainable output much above this level during the 1980s are poor.

While oil production is leveling off, domestic consumption of petroleum products is rising. The government has promoted domestic oil consumption by providing large consumer subsidies. In recent years, however, Jakarta several times has raised domestic fuel prices from 35 percent to 50 percent to relieve the rapidly growing drain on the government budget. Prices for some products such as gasoline are now close to international prices. Nonetheless, diesel fuel and fuel oil range from 25 to 35 percent below world prices, and kerosene, the primary household cooking and lighting fuel, remains about half the world price.

[1] In the international petroleum industry, a "supergiant field" is defined as one containing proved reserves of at least 5 billion barrels.

Although the world recession, which slashed exports and idled much of Indonesia's industry, and the reductions in subsidies slowed consumption growth to 5 percent annually in 1981 and 1982, we believe consumption will resume growing, if not at the 12- to 14-percent rates of the 1970s, probably by 10 percent annually as the economy recovers. Indonesia's per capita energy consumption still ranks among the lowest of the countries in Southeast Asia, and the share of its manufacturing sector in GDP is little more than half that of neighboring Malaysia, Thailand, and the Philippines. Given the need to provide jobs for the rapidly growing labor force, we expect the government to continue emphasizing industrialization, a process that will make growth of oil consumption almost unavoidable. Furthermore, although recent developments suggest the economy will grow more slowly than during the 1970s, we believe that even modest advances in industrialization will require rapid growth in petroleum consumption for industrial processing and transportation, given the dispersion of resources throughout the continental-sized archipelago and the current low level of industrialization.

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At a 10-percent annual growth rate, consumption would exceed 900,000 b/d in 1990, reducing the volume of oil available for export from 1.1 million b/d in 1981 to less than 700,000 b/d in 1990, unless there is a dramatic increase in substitution of other energy resources for domestically consumed oil products. Our estimate of export availability is considerably less than the Indonesian Government projection of over 900,000 b/d at the end of the decade.

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The Government's Energy Diversification Plans

Anticipating a long-term decline in oil exports, Indonesia's economic planners set ambitious goals at the beginning of the current 1979-84 Five-Year Plan to expand the output of natural gas, coal, hydropower,

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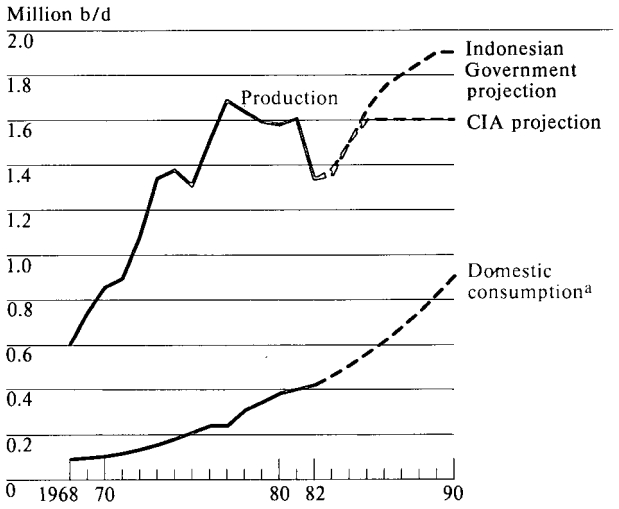
Figure 1
Indonesia: Oil Production and Domestic Consumption, 1968-90



[a] Consumption growth is projected at 10 percent annually for 1983-90.

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and geothermal energy. Their aim was to diversify both the composition of energy exports and the range of energy resources consumed in domestic markets. Oil would remain by far the most important form of energy in the 1980s, both for domestic consumption and as a source of export earnings to finance imports of capital goods. Natural gas, mainly in the form of LNG (liquefied natural gas), would become the country's second-largest export commodity. In domestic energy markets, the most visible change would be a sixfold increase in electric power capacity, with coal rising from a negligible share of fuel consumed in electricity generation to 65 percent, replacing most oil-fired capacity. The goals for the decade call for:

- Increasing crude oil output to 1.8 million b/d by 1983/84, and to 1.9-2.0 million b/d by 1989/90, roughly 20 percent above current production capacity.
- Doubling LNG exports to 15 million tons (400,000 barrels per day oil equivalent) by 1985. Indonesian officials also have claimed that exports could be redoubled again by 1990.
- Increasing coal output twentyfold to more than 6 million tons per year (80,000 b/doe) by the end of the decade.
- Raising the capacity of the public power system sixfold to about 14,000 MW (250,000 b/doe) by 1990 while gradually phasing out privately owned oil-fired power plants. 25X1

The World Bank estimated the cost of this program in 1981 at nearly $40 billion for the decade—as a percentage of GNP, the equivalent of a $500 billion program in the United States—with public spending accounting for over half. The Bank estimated that investment in oil and gas would account for almost $20 billion, largely from foreign oil companies operating under production-sharing contracts. Public-sector investment was to be concentrated on coal and electric power development. 25X1

According to the World Bank, achievement of the targets would result in a 45-percent increase in energy supplies. This would allow domestic energy consumption to grow 12 percent annually, with oil consumption growing slower than consumption of gas, coal, or hydropower. Total energy exports would remain at roughly 1.3 million b/doe, with higher LNG exports offsetting a decline in oil. 25X1 25X1

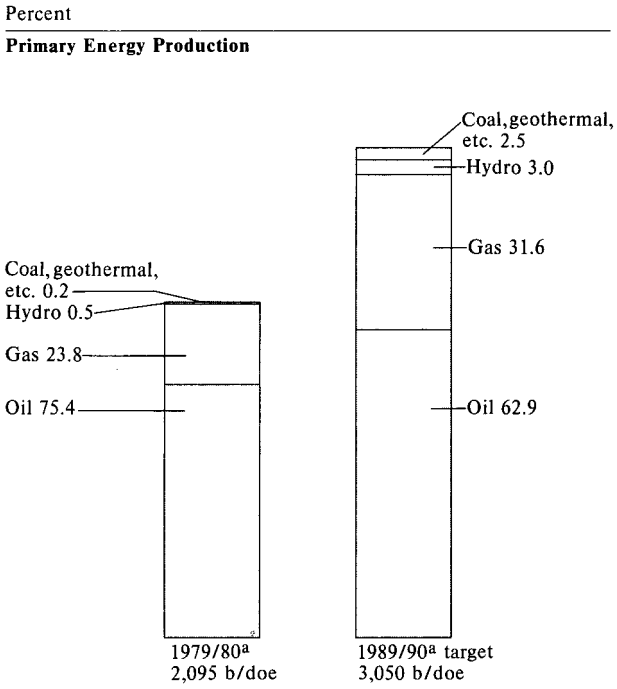
Nonoil Energy: The Push for Development

Foreign oil companies thus far have played the key role in diversifying energy exports. Huffco and Mobil, two US firms, rapidly developed natural gas exports for the Japanese market in the past decade in partnership with Pertamina. Progress in expanding output of coal, hydro, and geothermal energy has been slower, however, even with strong financial and technical assistance from the World Bank and other foreign aid donors. 25X1

Natural Gas: A Major New Industry

The discovery of the Badak and Arun Gasfields in the early 1970s opened up a new industry for Indonesia (see appendix). The two fields proved large enough to justify construction of LNG plants just when changes

Figure 2
Indonesia: Energy Diversification Plans



[a] Fiscal year ending 31 March of stated year.

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in the world oil market were spurring Japan to diversify energy imports away from heavy dependence on Persian Gulf crude oil. Pertamina signed 20-year contracts with two groups of Japanese utilities in the early 1970s, with the price of LNG tied to oil prices—a favorable index for Indonesia at the time. LNG exports to Japan, which began in 1977, reached about 7.5 million tons in 1980 (200,000 b/doe). Both plants are being expanded to increase exports to about 15 million tons annually by 1985. Jakarta is also trying to diversify its export markets and has signed an agreement to begin exporting LNG to South Korea in 1987, but the two sides have not yet agreed on pricing or on transportation arrangements.

Indonesian officials have repeatedly expressed optimism about the offshore Natuna Gasfield in hopes of adding another 15 million tons LNG output late in the 1980s. One foreign company believes that the presence of a large volume of carbon dioxide in the Natuna Gasfield rules this out, however. Besides the problem of disposing of the carbon dioxide, marketing prospects for additional LNG exports to Japan have been dimmed by the development of a competing natural gas installation in neighboring Malaysia, prospective development of LNG exports in Thailand and Australia, and Japan's scaling back of its energy consumption projections.[2]

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As to increased domestic consumption of gas currently flared as a waste product from crude oil production, low domestic prices make it unprofitable to gather small quantities of gas from widely scattered fields, particularly those located offshore or in onshore locations far from potential domestic consumers.[3] Moreover, major investments in pipelines and distribution systems would be needed to direct the flared gas to cities and other local consumers, and Jakarta has no

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[3] Some 35 percent of associated gas is reinjected into oil and gas wells to maintain reservoir pressures, and about 20 percent is sold as feedstock or fuel to petrochemical, fertilizer, and other industrial plants.

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firm plans toward this end. Thus we believe domestic natural gas consumption in the 1980s will continue to be concentrated in heavy industrial uses such as fertilizer, cement, and electric power production.

Electric Power: Coal-Based Expansion Under Way

Indonesia has embarked on a massive expansion of the country's electric power system, incorporating a shift from oil to coal as the primary fuel. Electric power generating capacity currently is divided between the 2,750-MW (50,000-b/doe) public power system operated by PLN, the state electricity firm, and about 2,600 MW (45,000 b/doe) in power plants (mainly oil fired) built by manufacturing firms to assure uninterrupted supplies to their plants. Since 1970 PLN has quadrupled its capacity from 660 MW and greatly improved its reliability. As a result, growth of capacity in small privately owned plants has been virtually nil since 1979, and most will be phased out as the PLN system expands.

In parallel with the expansion of generating capacity, the government is upgrading the transmission network to a high voltage system and extending it islandwide on densely populated Java. With about 65 percent of Indonesia's population, the density of Java's rural population makes rural electrification economically feasible. Less than 10 percent of its villages are now connected to the electric power system. Electrification would enable the government to phase out the small diesel-fired power plants now supplying electricity to many industrial installations and to substitute electricity for scarce kerosene in household lighting.

PLN's plans to shift increasingly to a coal-fired system would gradually take effect as new generating capacity becomes available. The government, however, is installing dual-fired generating units in a new electric power plant that can burn oil until coal becomes available. Currently, nearly 85 percent of PLN power is generated by oil. By 1990 PLN's plans call for coal to account for more than 65 percent of Java's electric power production.

Coal: Development Lagging

Plans for the rapid expansion of coal-fired electric power production are being thwarted, however, by lagging development of mines and transportation infrastructure to move the coal from Sumatra to power plants in Java. In the mid-1970s the government sought private foreign investment to help speed coal development. Jakarta signed a production-sharing agreement with a Shell Oil subsidiary in 1974 for exploration and development of South Sumatran coal. The government intended to use its share to fuel new electric power plants and other domestic industrial needs, while Shell would be allowed to export its share to earn a return on its investment. After spending $50 million on exploration and feasibility studies, Shell canceled its contract in 1978, when it concluded that South Sumatran coal could not compete with Australian or South African coal in the Japanese market because of its higher cost and lower quality.

Since Shell's pullout, the World Bank has taken the lead in assisting Indonesia to develop Sumatran coal. The Bank is financing a $1.1 billion project to boost output of South Sumatran coal from 150,000 tons in 1982 to 5 million tons (65,000 b/doe) by 1987 and to upgrade the transportation system. Work has been delayed, however, by a shortage of skilled managers and technicians.

Jakarta is still trying to attract private foreign firms to help develop coal. Since 1981 the government has signed seven production-sharing contracts for coal exploration and development in Kalimantan. Prospects for private investment in coal have been dampened, however, by the world oil glut, which is reducing the expected profitability of coal contracts and deterring the companies from aggressive exploration programs.

The World Bank questions whether the terms of the production-sharing agreements will encourage private coal development during the 1980s, no matter what happens to oil markets. The contracts allow the companies up to eight years for exploration and feasibility studies before they must either begin mining operations or return the tracts to the government. Although the Indonesians are hoping the companies will begin mining well before the deadlines, the decline in real oil prices probably will encourage the companies to postpone firm decisions as long as possible. Moreover, the companies are likely to base

development decisions on their own export prospects and to disregard Jakarta's domestic energy requirements in their calculations.

Hydroelectric and Geothermal: Minor Supporting Roles

Hydroelectric power plays a relatively small role in electricity production, largely because potential hydropower sites are far from major markets. In addition, large hydroelectric power plants operate most efficiently when they can achieve economies of scale either by supplying power to large industrial consumers or to a large integrated network. Hydroelectric power development on Java, consequently, has awaited the upgrading of the island's transmission system, which will not be completed until at least 1985-86. PLN's plans call for developing almost all of Java's 2,500 MW of hydropotential (60,000 b/doe) during the next 10 years, but the six- to nine-year leadtime needed to build power plants and the necessary transmission network in addition to the delays likely to result from current financial difficulties means that hydropower's role will remain small at least until the 1990s. Even then, it would supply less than 20 percent of Java's electric power needs, according to Indonesian Government projections

Jakarta has only recently begun tapping geothermal energy for commercial consumption by inaugurating a small geothermal power plant earlier this year. The Indonesians, with assistance from New Zealand, are now gaining experience using this resource and have signed a contract with Union Oil to build a larger commercial power plant later in the 1980s. In our judgment, geothermal resources will play a very minor role in energy production during the decade.

Diminishing Finances for Energy Diversification

The squeeze on government revenues caused by falling oil prices and production is forcing Jakarta to cut back both on energy-using industrial projects and on spending for alternative energy supplies. The government is "rephasing" [4] six major industrial projects valued at $10 billion, including several energy-related ones. President Soeharto also ordered a review of every industrial development project being financed with public funds, a move that involves about 40 projects valued at $30 billion, according to press reports. Soeharto said that, with few exceptions, only those contracts already awarded that do not require tapping foreign exchange reserves or international credit markets will be allowed to proceed as scheduled. These moves essentially halt progress on all major industrial projects until the government can reassess its spending priorities. 25X1

Jakarta's austerity moves also mean that public-sector spending for energy diversification will fall below the $2 billion per year previously projected by the World Bank, but at the cost of slowing energy diversification and the likely reduction of the amount of oil available for export. Energy-related projects that are being postponed include hydroelectric and coal-fired power plants on Java and coal mines in Sumatra. In addition, slowdowns in the expansion of electric power capacity in Sumatra and Kalimantan almost certainly will be made in parallel with rephased billion-dollar petrochemical complexes that would be major consumers of electric power. 25X1

Political and Financial Fallout 25X1

For Jakarta

Energy diversification will be slowed not only in proportion with cutbacks in spending but probably even more as the government finds it necessary to divert a larger share of funds to more immediate social and economic needs. 25X1

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resentment against the Soeharto government is growing because of its failure to live up to promises made during the 1983 presidential election campaign and because its spending cutbacks affect the poor without touching the elite. Continuing economic hardship could force the government to respond to growing public disaffection at the expense of longer term development needs. 25X1

For Washington

In the short run, the rephasing of major industrial projects will hurt US firms supplying engineering services and equipment for oil refineries, electric 25X1 25X1

[4] Before the "rephasing," the industrial development program included projects under way or in advanced stages of planning valued at $30 billion.

power plants, coal mines, and petrochemical complexes. For the longer term, the gradual decline in Indonesia's oil export capability in the 1980s could create strains between Jakarta and Washington. Indonesia now supplies about 6 percent of US crude oil imports, and its declining export capacity could result in reduced exports to the United States later in the 1980s, forcing American purchasers to seek supplies in areas of higher political risk

Abundant reserves of natural gas and a desire to diversify LNG markets also could prompt Indonesian officials to resurface the Pac-Indo LNG project.

Alternative Scenarios

Tougher Choices . . .

Although a slowdown in energy diversification seems almost certain over the next several years, Indonesia could soften the impact on the economy, although at a cost to current revenues or long-term oil production capability. For example, if the slowdown reduces oil export earnings to levels that threaten investment and future economic growth, the government could offer more generous production-sharing terms to foreign oil companies to spur exploration and step up production. Excessively rapid production, however, could damage the long-term production capability of Indonesia's oilfields.

There are other options that the government has already begun trying, but they require financial incentives and will take time before having much effect. For example, Jakarta is requiring oil companies to reduce flaring of gas. It could adopt tax policies or regulations to encourage energy production using waste products from lumber mills and other large industrial plants, spur retrofitting of inefficient petroleum refineries, and mandate the use of coal rather than oil in cement plants and other industrial installations. Through appropriate tax and subsidy policies, the government could also encourage interfuel substitution, such as liquefied petroleum gas (LPG) for kerosene in household cooking and lighting. The move to LPG, would require establishing an expensive retail system, however.

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. . . or a Firmer Oil Market

Should the demand for oil pick up sufficiently with Western recovery to allow Indonesia to return to full oil production capacity, there would be a greater impetus for oil and nonoil energy development and better prospects for substituting coal and gas for oil in domestic consumption. A revival of foreign exchange earnings from higher production would enable Jakarta on its own to accelerate spending on coal, hydropower, and geothermal resource development for the domestic market. Foreign firms might also accelerate coal exploration and development. Coal production would be encouraged if any of the companies exploring in Kalimantan found high-grade deposits that could compete in export markets. The long leadtimes involved in bringing these resource projects into production, however, would mean that much of the benefit of energy diversification for the economy would not actually be realized until the early 1990s, however.

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A less likely scenario would be the discovery of another supergiant oilfield in Indonesia. Discovery of a field comparable to Minas, the only supergiant producing oilfield in Southeast Asia, would add 350,000-b/d production potential to Indonesia's long-term capacity within five to six years of the discovery.

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Appendix

Energy Options—The Resource Base

Indonesia has plentiful supplies of conventional energy resources—natural gas, coal, hydropower, geothermal, and agricultural waste products—but not all is suitable for development as a supplement to or substitute for oil in domestic consumption and exports.

Natural Gas

According to the World Bank, Indonesia's natural gas reserves are estimated at 69 trillion cubic feet (tcf) roughly equivalent to 8-9 billion boe. Some 85 percent is in three large fields not associated with crude oil reservoirs. The Badak field in East Kalimantan, discovered by the US firm, Huffco, in 1971 contains an estimated 9 tcf. The Arun field, discovered by Mobil Oil in Aceh, Sumatra, in 1972, contains some 17 tcf. The offshore Natuna field in the South China Sea is the largest of the three, with estimated reserves of 35 tcf. This field, however, also contains some 80 to 90 tcf of carbon dioxide, which presents serious technical production and marketing problems for Exxon, which is conducting feasibility studies under a production-sharing contract.

Coal

Coal deposits occur in all of Indonesia's major islands—Sumatra, Java, Kalimantan, Sulawesi, and Irian Jaya—but detailed studies of reserves exist only for Sumatra. Rough estimates of Indonesia's coal reserves range as high as 10-20 billion tons (42-84 billion boe) but the Ministry of Mining and Energy estimates minable reserves at 2.6 billion tons (roughly 11 billion boe) and proved reserves at only 300 million tons (1.3 billion boe). The two major sites of proved reserves are the Bukit Asam mine in South Sumatra, with an estimated 160 million tons of reserves, and the Ombilin mine in West Sumatra, with about 65 million tons.

The other region of significant coal potential is South and East Kalimantan where eight major basins have been identified. Potential reserves could amount to billions of tons, according to a World Bank Study, but detailed exploration so far has been carried out in only one area, where reserves may be as high as 140 million tons. 25X1

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One of the major drawbacks to developing coal in Indonesia is that most of the country's known resources are subbituminous brown coal and lignite suitable only for burning as power-plant fuel or as boiler fuel in industrial plants located near the mines. High moisture content and low heating values make most of the coal discovered uncompetitive in export markets. 25X1

Hydropower

Indonesia's hydroelectric potential is estimated at 31,000 MW, capable of producing 155 billion KWh annually, roughly equivalent to 780,000 b/doe distributed as follows:

Region	Theoretical Capacity *(1,000 megawatts)*
Total	**31,000**
Sumatra	6,750
Java	2,500
Kalimantan	7,000
Sulawesi	5,600
Irian Jaya	9,000
Other	150

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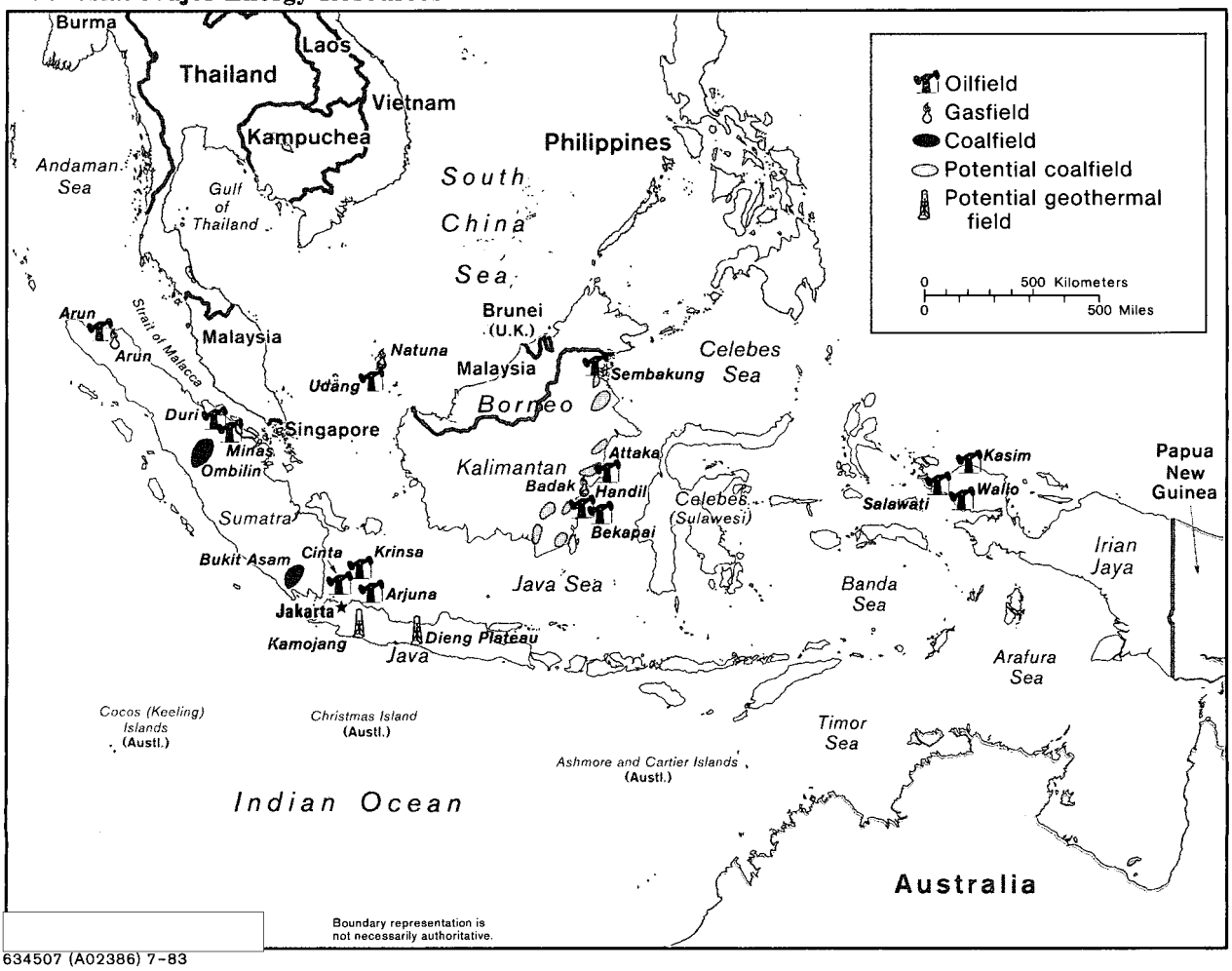
Despite the large potential, development is limited by the remoteness of hydropower sites from markets. Java, for example, with 65 percent of the country's population, accounts for about 80 percent of current demand for electric power but has only 8 percent of potential hydropower resources. Alternatively, Irian Jaya, which accounts for only about 1 percent of demand for electricity, has almost 30 percent of the country's hydropower potential. Likewise, sparsely 25X1

Figure 3
Indonesia: Major Energy Resources



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populated Sumatra, Kalimantan, and Sulawesi have proportionately larger shares of hydropotential than Java.

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Geothermal

Surface indications of geothermal energy, such as hot springs and volcanic steam, have been found on all the major islands except Kalimantan, but only a few areas have been extensively explored, mostly on Java. Identified reserves are currently estimated at almost 1,500 MW (equivalent to about 25,000 b/d), although potential reserves may approach 10,000 MW, according to Asian Development Bank studies, distributed as follows:

Region	Potential Reserves *(1,000 megawatts)*	Identified Reserves *(1,000 megawatts)*
Total	**10,000**	**1,460**
Java	5,500	890
Sumatra	1,100	270
Sulawesi	1,400	180
Others	2,000	120

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Oil

Indonesia's proved oil reserves have been estimated by most industry observers at 10-15 billion barrels since the early 1970s. Indonesian officials are much more optimistic and have made frequent public claims that reserves are as high as 50 billion barrels. Citing the fact that only nine of the country's 28 major sedimentary basins have been extensively explored, they assume commercial fields would be found in relatively less explored basins. Nonetheless, active exploration by foreign oil companies in the geologically most promising regions since the late 1960s has only added proved reserves roughly equivalent to the volume of oil produced during this period.

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